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The alleged Early Palaeolithic artefacts are in reality geofacts: a revision of the site of Kończyce Wielkie 4 in the Moravian Gate, South Poland

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ABSTRACT

In this paper we show that a site Kończyce Wielkie 4 (SW Poland) published in JAS (2010a) by Foltyn et al. can no longer be accepted as a reliable evidence for the oldest presence of humans in the northern part of Carpathians and Sudetes Mountains (Matuyama-Brunhes). Unfortunately, in the light of conducted analysis among others with Peacock's method, it seems that the lithics from Kończyce Wielkie appear to be much more similar to geofacts rather than to artefacts. As a background for comparison Lower Paleolithic artefacts from two German sites Wallendorf and Wangen were used. Moreover, the petrological determination of the finds from Kończyce Wielkie is also dubious issue. Foltyn et al. suggested a long distance transport of lithics from several sources. As it has been demonstrated in the paper, local glacial sediments consist of rocks that are analogous to published lithic spectrum. Finally, the geological data shown by Foltyn et al. seem to be incorrect. Authors did not take into account the results concerning the regional geology that indicate clearly much younger age of layers dated by Foltyn et al. (2010a) at the beginning of the Middle Pleistocene.

1. Introduction

Stone artefacts and organic remains are crucial in identifying the oldest stages of settlement of hominids in a given area. Irrespective of the material finds are made of, they should have attributes that make it possible to relate them to hominid activity (e.g. Patterson, 1983; McPherron et al., 2010; Domínguez-Rodrigo et al., 2010). Also important is the stratigraphical context of the finds as this should point to a low probability of the redistribution of artefacts and limits the misleading qualification of findings (i.e. geofacts) as artefacts (Albrecht and Moser, 1996; Baales et al., 2000; Gillespie et al., 2004; Hemingway et al., 1989; Obermaier, 1906, 1912; Oakley, 1961; Roebroeks and Stapert I986; Schick, 1986; Speth, 1972; Stapert, 1976; Warren, 1905, 1914). The stratigraphical context also usually allows the dating of an event of the deposition of artefacts. Obviously, only an explanation of the aforementioned issues allow us to construct a model of human colonization on a given territory (Carbonell et al., 2008; Carbonell and Rodríguez, 2006; Cohen et al., 2011; Dennell and Roebroeks, 2005; Doronichev, 2008; Doronichev and Golovanova, 2010; Lahr, 2010; Muttoni et al., 2010; Paŕes et al., 2013; Rolland, 2002, 2013).

In the part of Europe located north of the Alps and the Carpathians the problem of the earliest colonization became a point of particular interest during the last decade (Fig. 1). This was an indirect result of the discovery of a number of sites on the British Isles dated to the Early and early Middle Pleistocene that is 0.78–1.0 Ma (Ashton and Lewis, 2012; Cohen et al., 2011; Parfitt et al., 2005, 2010). This discovery made the concept of 'the short chronology' redundant (Roebroeks and Kolfschoten, 1995) and stimulated interest in 'continental' sites, which had been slightly marginalized, as happened with, e.g. sites from the Loire valley, e.g. Pont de Lavaud (Despriée et al., 2011). An important role in changing the current view on the beginnings of Europe's colonization played discoveries of sites and narrowing dating of series of sites from southern Europe which are older than 1 million years: Barranco León, Fuente Nueva-3, Sima del Elefante or Pirro Nord (Arzarello et al., 2012; Pares et al., 2006; Duval et al., 2012).

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Fig. 1. Early and Middle Pleistocene sites mentioned in the text: yellow rings denote sites with lithic artefacts, human and fauna remains, white star marks location of the Kończyce Wielkie site. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Recently, such an early colonization by hominids in the area north of the Carpathians has been reported from Poland (Fig. 2). In 2010, materials from the site of Kończyce Wielkie 4, dated to a period before the Matuyama/Brunhes reversal, were published by Foltyn et al. (2010a, 2010b). The aforementioned authors ascribed their findings to an 'industry consisting of pebble, flake as well as microlithic specimens.' According to them, the presented data seem to point to the development of intercontinental migration trails and to the crossing of mountain ranges during this alleged early stage of colonization, interpreted as contemporaneous with remains from the Pakefield site (Parfitt et al., 2005).

The aim of this paper is to critically discuss remarks concerning the interpretation of the Kończyce Wielkie 4 site presented by Foltyn et al. (2010a, 2010b). In our opinion, this site does not contain any objects that can be unequivocally considered as ones produced by humans. Based on attribute analysis, we provide evidence that the reported finds are rather an effect of natural, glacigenic and fluvial factors. They can thus be classified as geofacts and not artefacts, the criteria of which they do not meet. Nor are they so-called incertofacts, i.e. 'a category of pieces whose artificial character can be neither established with certainty nor excluded' (Roebroeks and van Kolfschoten 1995, 304). We also show here that the results of the stratigraphical and palynological analyses of the site at Kończyce Wielkie published by Foltyn et al. (2010a, 2010b) contain many inaccuracies. These have contributed to an incorrect interpretation of both the sedimentary environment and the age of the sediments from this site, which, in our opinion, are much younger than the Early or Middle Pleistocene.

The authors believe that problem geofacts discussed here, not only concerns the site in Kończyce Wielkie. Despite a long tradition of research on this topic, it is constantly present.

2. Materials, sites and finds

Apart from the data from Kończyce Wielkie, findings of geofacts and artefacts from other sites are taken into consideration in this paper (Fig. 3). The comparative material comes from three sites. One of them (Mokrzeszów, SW Poland) supplied obvious geofacts, the other two (Wallendorf and Wangen, Germany) are known to be Lower Palaeolithic sites (Fig. 4).

2.1. *Kończyce Wielkie 4*

Kończyce Wielkie is located in the eastern part of the Ostrava Basin, which is located in the foreland of the Sudetes, the Carpathians and at the mouth of the Moravian Gate (Fig. 2; Tyráček, 2011a). In

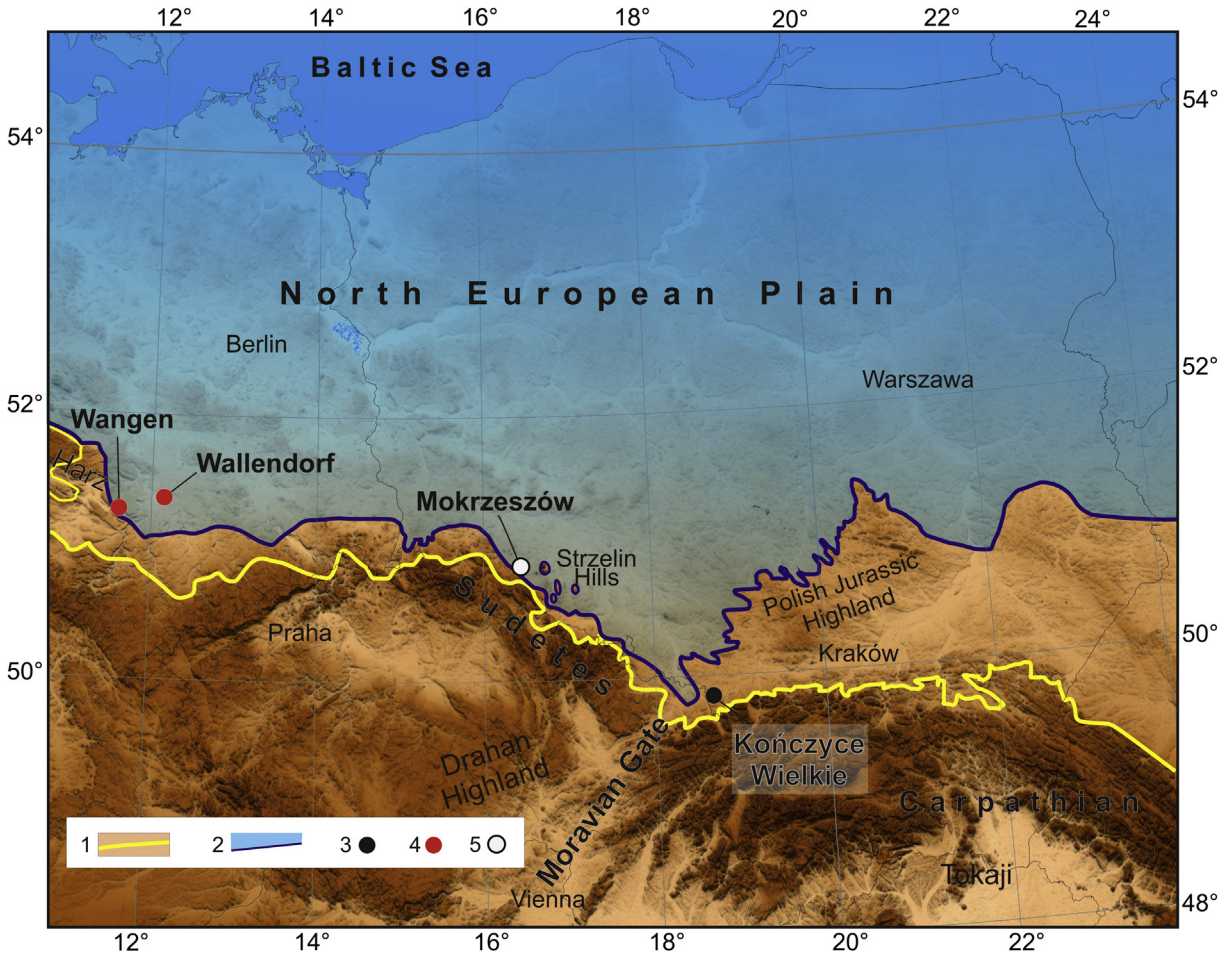

Fig. 2. Location of studied sites in relation to the Scandinavian ice sheet margin position during maximum extent of the Elster and Drenthe (Odra) glaciations in Central Europe according to Ehlers et al. (2004) and Marks (2005): 1 – extent of the Elster glaciation (MIS12); 2 – extent of the Drenthe glaciation (MIS6); 3 – Kończyce Wielkie 4 site; 4 – Lower Palaeolithic sites; 5 – the Mokrzeszów site with geofacts. Described by J. Badura and A. Wiśniewski.

Poland the eastern part of the Ostrava Basin is called Wysoczyzna Kończycka (Kondracki, 2009). It rises to a height of about 270 m a.s.l. The Moravian Gate creates more than 60 km long lower portion between the Sudetes and Carpathians. Through its bottom and the Ostrava Basin the Odra River flows to the north. During the Elster and Drenthe glaciations the Scandinavian ice sheet moved along the Odra River valley to the area of the Moravian Gate reaching there its greatest extent in Central Europe (Macoun and Králík, 1995; Růžička, 2004; Nývlt et al., 2011; Tyráček, 2011b). The glacial lobe entering the Moravian Gate transgressed more than 30 km deeper than the rest of the ice sheet resting against the edges of the Sudeten and the Carpathians. Northern frame of the Ostrava Basin is formed by the Głubczyce Plateau and the Rybnik Upland. These elevations during the Drenthe glaciation formed a natural barrier to the glacier, which did not enter the Ostrava Basin or only reached the northern part of it. In the basin an extensive glacial lake was created. The northern range limit of the ice sheet still remains the subject of discussion because some geologists believe that the extent of the ice sheet was at least as large as the previous one - the Elster, and the others that it was smaller (Macoun and Králík, 1995; Lewandowski, 1988; Růžička, 2004; Nývlt et al., 2011; Tyráček, 2011b).

The objects considered as artefacts were found in glacial sediments or, more precisely, in a thin gravelly sand fluvioglacial bed, 20 cm thick, above the lower resting on top of a several metre thick complex of gravel, directly underlying a glacial till (see Fig. 6). Foltyn et al. (2010a, 2010b) based their diagnosis as to the age of the sediments from this site on the age determination by Wójcik et al. (2004) that rested on palaeomagnetic and palynological analyses. The finds from Kończyce Wielkie are considered by these authors to occur in early Middle Pleistocene sediments.

2.2. Comparative sites

The site of Mokrzeszów is located at the northern foreland of the Middle Sudetes, in the southwest part of the Roztoka-Mokrzeszów tectonic graben, on the downtrown side of the northwest-trending Sudetic Boundary Fault (Fig. 2). The area is covered by Pleistocene deposits, resulting from three successive glaciations (Badura et al., 1992): those of the Elster (San 1 and San 2) and of the Drenthe (Odra). The site has exposed sands and gravels of the Odra glaciation (Krzyszkowski and Bowman, 1997; Krzyszkowski et al., 1995; Salamon et al., 2013). In the coarse-grained sediments numerous flint nodules, chunks and small flakes can be found, the latter two apparently resulting from the fragmentation of larger clasts. Already in the 1990s, J. Bronowicki had collected several tens of such finds and considered them as artefacts. However, after a thorough analysis of their geological context, state of preservation and features having a bearing on their possible origin, they were subsequently reinterpreted as geofacts (Wiśniewski, 2006, 110, 221). For the sake of our comparative analysis, this collection has been completed with finds obtained in 2011 by J. Badura and A. Wiśniewski.

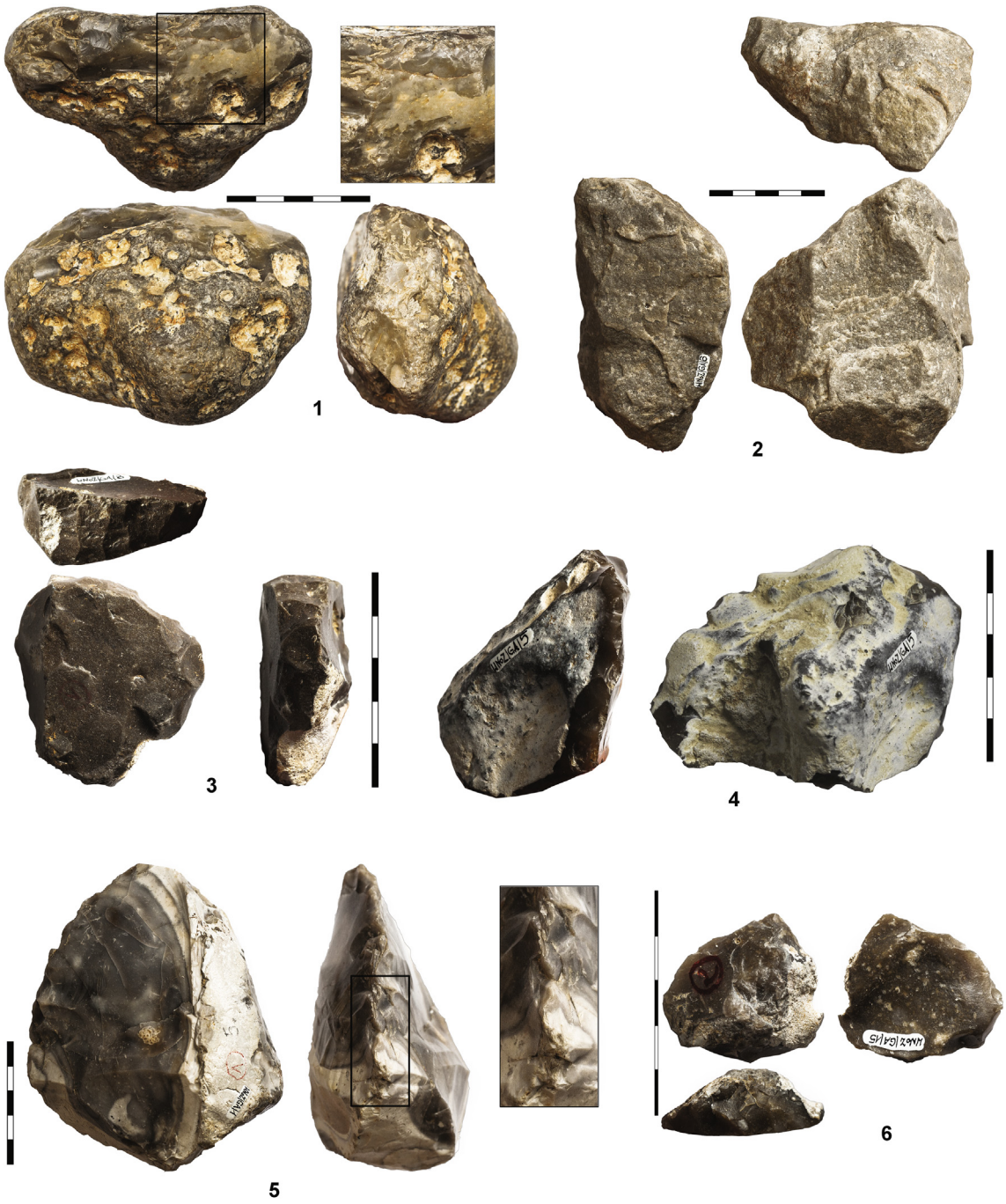

Fig. 3. Selection of finds from the Kończyce Wielkie site: 1 – Pebble with traces of the damage of arrises, ridges and surface (enlarged photo demonstrates alteration of surface and presence of Hertzian cone cracks), erratic flint; 2 – Chunk with traces of abrasion in the area of ridges and arrises, quartzite; 3 – Chunk with naturally blunted edge which imitates steep removals, erratic flint; 4 – Fragment of nodule with cortex and marginal removals. Short negatives were created due to multidirectional impacts, erratic flint; 5 – Fragment of pebble with naturally shaped edge resulted from pressure/impacts (enlarged photo shows the crashed edge), erratic flint; 6 – Chunk with fresh negatives resulted from multidirectional impacts, erratic flint. Photo by courtesy of the Museum of the Faculty of Earth Sciences at the University of Silesia in Sosnowiec. Photo by Maksym Mackiewicz.

The artefacts to be analysed here were selected from two Lower Palaeolithic sites located in Saxony Anhalt, East Germany. Selecting sites for comparative analysis we took into account the similarities in terms of sedimentological environment (fluvial sediments) as well as techno-typological characteristics (Lower Palaeolithic flake industries).

The site of the first one, Wallendorf, Kreis Merseburg (Figs. 2 and 4:5–8), has been known to archaeologists since the beginning of the 20th century (Bernhardt et al., 1997; Schäfer, 1994; Weber and Thum, 1991). The artefacts, accompanied by the skeletal remains of mammals and by malacofauna, were found in fluvial gravels exposed in a gravel pit. All the artefacts were displaced and redeposited. The gravel containing them is synchronized with the Holstein interglacial or the beginning of the Saale glaciation (=Middle Polish Glaciation) (Weber and Thum, 1991). The collection is dominated by flakes, while cores and tools occur sporadically. Until 1997, the inventory contained 3360 artefacts (Bernhardt et al., 1997, 17) interpreted as Clactonian (Schäfer, 1994).

The second site, Wangen, Kreis Nebra (Figs. 2 and 4:1–4), provided far less numerous artefacts than Wallendorf. They come from gravels

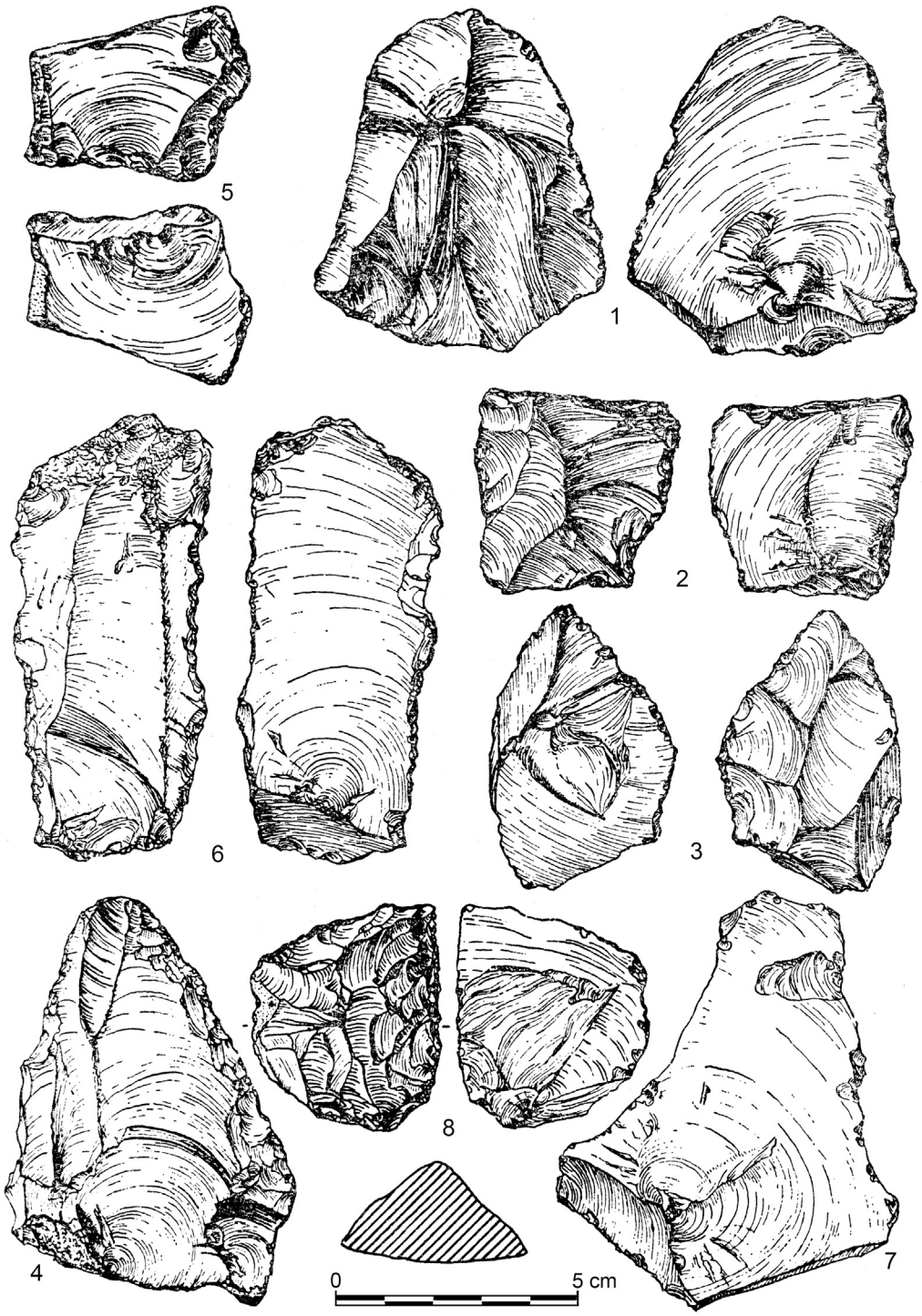

Fig. 4. Selection of flint artefacts from Lower Palaeolithic sites: Wangen (1–4) and Wallendorf (5–8) (after Toepfer, 1964). On the ventral sides of finds Hertzian cones, prominent bulbs and bulb (éraillure) scars are visible, while on the dorsal sides flake scars and negative dorsal bulbs can be seen (4–5).

in a terrace of the River Unstrut. This site is interpreted as slightly older than that of Wallendorf and dated to a late stage of the Elster glaciation or to the cold stage of the Holstein interglacial (Schäfer, 1994).

3. Methods

3.1. Archaeology

While analysing the inventory, features related to raw material variability, depositional environments as well as its origin (natural vs. anthropogenic) were taken into account. One of the authors (AW) compared the original finds from Kończyce Wielkie with geofacts from Mokrzeszów and artefacts from Lower Palaeolithic sites: Wallendorf and Wangen.

With regard to the attributes related to deposition, attention was paid to the fragmentation and abrasion of the finds (Table 1). Assuming that the sedimentary environment is known, these attributes can answer the question concerning of whether the finds are significantly displaced or occur roughly in places of their abandonment by people (Schick, 1986; Stapert, 1976).

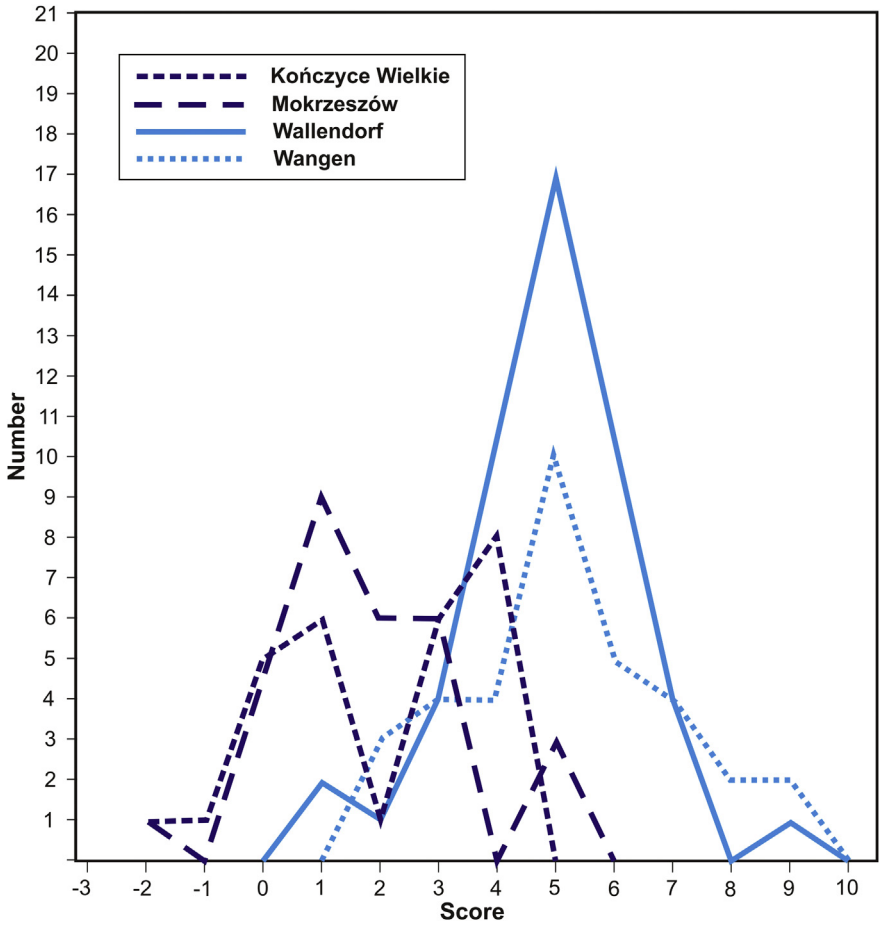

Fig. 5. Aggregate scores for the Kończyce Wielkie finds, natural samples from Mokrzeszów and Lower Palaeolithic artefacts from Wallendorf and Wangen. Described by A. Wiśniewski.

To conduct artefact authenticity test, a study of 11 attributes was undertaken (Table 2). These were the attributes developed by Peacock (1991) for studying the modification of lithics from the British site of Krimington. The presence or absences of particular attributes were noted in the collections from Kończyce Wielkie and Wallendorf. Following the procedure of Peacock, each of the 11 attributes was subjected to a chi-square test of independence. Wallendorf was chosen for this analysis because of its more abundant inventory in comparison with Wangen. The Statistica package was used in the calculations. The test was intended to show how significant are particular attributes in resolving the question of human participation in the origin of finds (Table 3). Two hypotheses were put forward:

H_0; No significant differences exist between the attributes of sampled artefacts from Wallendorf and of finds from Kończyce Wielkie.

H_1; The attributes of artefacts from Wallendorf and of finds from Kończyce Wielkie are significantly different.

Analogous to Peacock's methodology in his test, an appropriate score, 1 or 0, was assigned to each attribute, corresponding to the presence or absence of a given attribute, respectively. Different scales were applied to three attributes. The first one concerned the dorsal surface of a flake. In the case of a dorsal surface totally covered with cortex, 1 point was deducted. A partial covering by the cortex was considered as neutral and assigned 0 points. No cortex resulted in 1 point. Differential weathering of flake scars was also considered indicative of a natural origin. When this attribute was present, 1 point was deducted; the absence resulted in zero points. A successive exception concerned the bulb. Both a diffuse bulb and no bulb lead to no points being ascribed. A prominent bulb yielded 1 point.

In the subsequent step, scoring was calculated for each find based on the presence or absence of the appropriate features (Peacock, 1991, 355). This method, however, has its limitations, and it does not produce decisive answers as to whether a given object is a geofact or not. It rather provides information that in a given population of finds, geofacts or artefacts predominate. Only by comparison with groups of known geofacts and artefacts is it possible to determine whether an inventory comprises geofacts or artefacts. The results of such a comparison between finds from all the mentioned sites are shown graphically, using a linear graph in Fig. 5.

Apart from the above listed procedures, the presence of Hertzian cones on butts and the number of dorsal flake scars were also taken into account. These attributes were compared with those from the two Lower Palaeolithic sites and the one with geofacts (Table 4).

3.2. Geology

The basis for the revision of the geological diagnosis of Wójcik et al. (2004) and Foltyn et al. (2010a, 2010b) were the results of: (1) the sedimentological and palaeoenvironmental study conducted by Salamon and Wójcik (2010); (2) earlier investigations of loess by Jersak and palynological analyses of the underlying muddy

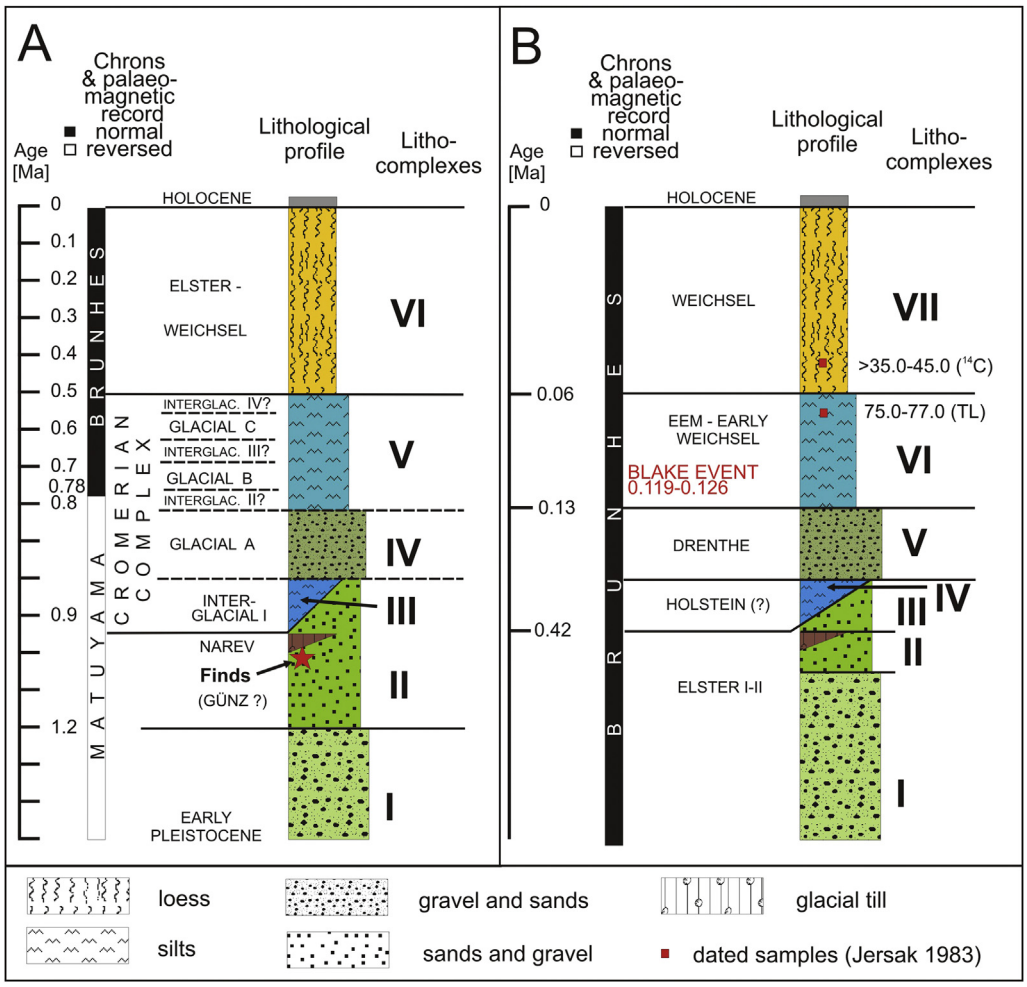

Fig. 6. Chronostratigraphical correlation of the profile at Kończyce Wielkie site: A – according to Foltyn et al. (2010a, 2010b); B – according to authors after Salamon and Wójcik (2010). Chronostratigraphical correlation and palaeomagnetic record after Gibbard et al. (2005).

sediments by Jastrzębska-Mamełka (Jersak, 1983; Jersak et al., 1992), and (3) dating of loess from Kończyce Wielkie with the TL method (Table 5; Fig. 6; G. Adamiec – pers. comm.). All the above results are considered here in the context of geological and geomorphological investigations that were carried out in the catchment of the nearby upper Wisła River (Starkel et al., 2007), on the Rybnik and Głubczyce plateaux (Badura and Przybylski 2004; Jary 2007; Lewandowski 1988; Salamon, 2009), and in the north-east part of the Czech Republic (Břízová, 1994; Macoun et al., 1965; Macoun, 1985a, 1985b, 1989; Macoun and Králik, 1995; Musil, 1993; Nývlt et al., 2011; Růžička, 2004; Tyráček and Havlíček, 2009; Vodičková, 1981).

4. Results and discussion

The site of Kończyce Wielkie yielded 50 stone finds, that are now stored in the Museum of the Faculty of Earth Sciences, Silesian University. Foltyn et al. (2010a) list 45 items (Fig. 3). Our revision of the published materials enabled new determinations of raw material variability, of the state of preservation and of the origin of the objects in question. It also helped us to verify the original geological diagnosis (Wójcik et al., 2004), on which the dating of the site was based (Jersak, 1983; Jersak et al., 1992). Our conclusions are much different from those of Foltyn et al. (2010a, 2010b) and this requires discussion.

4.1. Archaeology

4.1.1. Raw material

The circulation of raw materials is often used as a key argument for the anthropic origin of finds. The authors of the discussed interpretations of Kończyce Wielkie have distinguished artefacts made of local erratic flint (27 items, 60% of the total) and made of imported rocks (Foltyn et al., 2010a, 1891, Table 1; Foltyn et al. 2010b, 22–23, Table 1). In their opinion, 4 items (8.9% of the total) were made of Rauracian or Oxfordian flint and one (2.2% of the total) of 'Jurassic flint', outcrops of which are located on the Cracow-Częstochowa Upland. They also recognised two opalite objects (4.4% of the total) from northern Hungary and nine (20% of the total) hornstone items from Moravia. Single finds of granite and quartzitic sandstone (see Fig. 3: 2) interpreted as originating from the Drahany Upland in Moravia) were also reported. The petrographical diagnosis of the above rocks was entirely based on macroscopic examination.

According to the authors' model (Foltyn et al., 2010, 1891) the Hungarian opalite is supposed to come from deposits located in distance of 250 km to the SE, the Drahany quartzite about 120 km to the SW, the hornstone from Moravia, i.e. at least 60 km, while the Rauracian and Oxfordian flint as well as the Jurassic flint 90 km to NE, the granite from the Strzelin area instead was transferred at least 140 km (e.g. Přichystal, 2009). The erratic flint is actually

Table 1
Fragmentation and edge modification among examined finds.

Sites	Fragmentation and edge modification		Abrasion	
	N	%	*N*	%
Kończyce Wielkie 4	21	75	19	65.86
Mokrzeszów	23	76.66	24	80
Wallendorf	10	20	34	68
Wangen	9	25.71	16	45.71

available everywhere within Kończyce Wielkie and the surrounding area. It comes from glacial moraines and fluvioglacial deposits (see 4.2.).

In the present authors' opinion, all the cryptocrystalline siliceous rock finds represent clasts, redeposited from one source that was once built up of morainic and fluvioglacial sediments. The redeposited flints are known to occur in the entire upper part of the Odra River valley and its catchment area (Dmochowski, 2006; Kozłowski and Pawlikowski, 1989). In glaciogenic sediments, an admixture of Jurassic flint can be expected, as in the flint-bearing Jurassic strata crop out nearby, in the vicinities of Opole (Přichystal, 2009). The quartzitic sandstone as well as the granite must have also been supplied to Kończyce Wielkie by a moving ice sheet, but it comes from the adjacent Sudety Mountains (see Fig. 2).

In our opinion, the concept of transport of raw materials from the south and north to a place where erratic flint of very good quality is available does not seem realistic. It is not compatible with the contemporary state of research on behaviour of the Palaeolithic humans who exploited primarily local rock resources (e.g. Barsky et al., 2010). From the area of Eurasia is not known an example of a site showing traces of so complicated and distant transport of stone raw materials. Indeed, to a later period are dated traces of raw materials or products transport from different zones in distance of tens of kilometres in a straight line. It concerns, however, natural shelter places in the so-called broken landscape, e.g. Caune de l'Arago (Wilson, 1988).

Table 2
Flake characteristics using features of Peacock (1991).

Attributes	Kończyce Wielkie 4		Mokrzeszów natural		Wallendorf artefacts		Wangen artefacts	
	N	%	*N*	%	*N*	%	*N*	%
Bulb of percussion								
Prominent	1	3.85	2	7.69	33	66.00	20	57.14
Diffuse	12	46.15	7	26.92	17	34.00	15	42.86
None	13	50.00	17	65.38	0	0.00	0	0.00
Total	26	100.00	26	100.00	50	100.00	35	100.00
Ripple lines								
Yes	9	32.14	6	20.00	48	96.00	33	94.29
No	19	67.86	24	80.00	2	4.00	2	5.71
Total	28	100.00	30	100.00	50	100.00	35	100.00
Radial lines								
Yes	1	3.70	3	10.34	22	44.00	22	62.86
No	26	96.30	26	89.66	28	56.00	13	37.14
Total	27	100.00	29	100.00	50	100.00	35	100.00
Bulbar scars								
Yes	9	34.62	17	65.38	38	76.00	27	77.14
No	17	65.38	9	34.62	12	24.00	8	22.86
Total	26	100.00	26	100.00	50	100.00	35	100.00
Differential weathering of flake scars								
Yes	19	67.86	24	80.00	34	68.00	16	45.71
No	9	32.14	6	20.00	16	32.00	19	54.29
Total	28	100.00	30	100.00	50	100.00	35	100.00
Faceted platform								
Yes	2	10.53	0	0.00	8	16.00	7	20.00
No	17	89.47	19	100.00	42	84.00	28	80.00
Total	19	100.00	19	100.00	50	100.00	35	100.00
Cortex on platform								
Yes	5	26.32	9	50.00	17	34.00	12	34.29
No	14	73.68	9	50.00	33	66.00	23	65.71
Total	19	100.00	18	100.00	50	100.00	35	100.00
Cortex on dorsal surface								
Completely	3	10.71	4	13.33	0	0.00	3	8.57
Partially	15	53.57	15	50.00	34	68.00	16	45.71
None	10	35.71	11	36.67	16	32.00	16	45.71
Total	28	100.00	30	100.00	50	100.00	35	100.00
Two-plus flake scars on dorsal surface								
Yes	17	68.00	19	73.08	35	70.00	27	84.38
No	8	32.00	7	26.92	15	30.00	5	15.63
Total	25	100.00	26	100.00	50	100.00	32	100.00
Dorsal flake scars parallel with medial axis								
Yes	11	45.83	7	28.00	35	70.00	18	56.25
No	13	54.17	18	72.00	15	30.00	14	43.75
Total	24	100.00	25	100.00	50	100.00	32	100.00
Negative dorsal bulb								
Yes	3	12.50	6	24.00	35	70.00	20	62.50
No	21	87.50	19	76.00	15	30.00	12	37.50
Total	24	100.00	25	100.00	50	100.00	32	100.00

4.1.2. State of preservation of the finds

The state of preservation of the finds is of significance in deciding whether an artefact had been displaced and redeposited or was found roughly in the place of its abandonment. Foltyn et al. (2010a, 1891) have recognized that the state of finds' preservation does not confirm distant transport for the items from Kończyce Wielkie. Except for a few finds, they report that most are not rounded and show sharp edges and arises between flake scars. In contrast, however, glossy surfaces are frequent. Minor fragmentation is also noted (Foltyn et al., 2010a).

We have investigated the state of preservation in a sample of flakes and flake tools (28 finds), which, by their nature, reflect the influence of a sedimentary environment better than cores or core tools. From our analysis, it was evident that 75% of the material (21 objects) is damaged, showing fractures or traces of a significant natural modification of the edges. Unfortunately, Foltyn et al. (2010a, 1893) interpret natural alterations of the ridges as step and high retouch, marginal retouch (Fig. 3: 3, 6), denticulate retouch or even as the negatives of burin blows. It must be thus emphasized that surfaces of the so-called retouch scars on Kończyce Wielkie finds are in fact often fresher than the dorsal or ventral surfaces of the flakes. This points to the fact that the edge modifications must have formed later than the flakes (see our remarks below concerning the core tools). Equally high is the percentage (more than 65%, 19 objects) of the material with traces of surface or edge abrasion (see also core-like finds in the Fig. 3: 1, 2).

One can compare the data concerning the fragmentation and abrasion of the finds from Kończyce Wielkie with those related to natural flakes from Mokrzeszów and to artefacts (flakes) from the two Early Palaeolithic sites of Wangen and Wallendorf (Table 1). The comparison shows that the attribute of abrasion is not a good indicator of the anthropic origin of finds.

Thus, it can be concluded that the manifestations of abrasion are too frequent and intense on the material from Kończyce Wielkie to allow for the interpretation of the finds as occurring *in situ*. The fragmentation and edge destruction must have developed, in their turn, under the influence of natural environmental factors rather than due to human activity.

4.1.3. Testing the mechanical and technological attributes

Of fundamental significance in the discussion on the value of the Kończyce Wielkie site is the examination of lithics as human-made products, which can be demonstrated through an analysis of features related to the mechanics of flake production and the technology. While testing the material from Kończyce Wielkie all the attributes were evaluated at the beginning after the proposal by

Table 3
A chi-square test comparing artefacts from Wallendorf and finds from Kończyce Wielkie.

Attribute	Degrees of freedom	Chi-square	*P*	H_0	Addtional remarks
Ripple lines	1	34.03	0.0000	Rejected	Yates
Radial lines	1	11.73	0.0006	Rejected	
Bulbar scars	1	12.41	0.0004	Rejected	
Differential weathering of flake scars	1	0.00	0.9897	Accepted	
Faceted platform	1	0.04	0.8460	Accepted	Yates
Cortex on platform	1	0.10	0.7469	Accepted	
Cortex on dorsal surface	1	0.11	0.7385	Accepted	Completely&partially have been summarized
Two-plus flake scars on dorsal surface	1	0.03	0.8595	Accepted	
Dorsal flake scars parallel with medial axis	1	4.03	0.0448	Rejected	
Negative dorsal bulb	1	19.22	0.0000	Rejected	Yates

Peacock (Table 2). It was subsequently tested whether the attributes of the material from Kończyce Wielkie do not differ from the artefacts from Wallendorf using the chi-square method (Table 3).

Based on the chi-square results, one can conclude that significant differences between the inventories from Kończyce Wielkie and from Wallendorf concern the development of ripple and radial lines, bulbar scars, dorsal flake scars parallel with medial axis and negative dorsal bulbs.

In the chi-square test the presence and quality of the bulb as a percussion feature was excluded. The reason for this omission is the lack of artefacts without a bulb at the Wallendorf site. However, as is visible in Table 2, the differences concerning the presence of a bulb on the finds from Kończyce Wielkie and Wallendorf as well as from Wangen are considerable (see Fig. 4). The lack of prominent bulbs at Kończyce Wielkie would have been understandable if its inventory showed traces of the application of the technique on anvil, where the bulbs are, as a rule, weakly expressed (Cotterell and Kamminga, 1987). The possibility of the application of this technique in Kończyce Wielkie is contradicted by the appearance of the flake dorsal surfaces, which do not show a characteristic increased density of ripples (Andrefsky, 1998, 124–125).

Ripple lines are the result of mechanical flaking and are not directly related to a technique (Cotterell and Kamminga, 1979, 108). It seems they are better expressed in a cryptocrystalline, homogeneous material of isotropic structure. At the same time, they can be less visible on artefacts that have undergone strong aeolian or water abrasion or on patinated ones. A minor percentage of distinct ripples at Kończyce Wielkie seem to point either to abrasion or to the non-industrial origin of the flakes. Peacock (1991, 351) did not find differences between a collection of geofacts and anthropic specimens in terms of ripple lines.

Radial lines were also taken into account as a significant differentiating feature, which can have originated both due to the exerting of pressure and to percussion (and which are also called fissures, lances or striations, e.g. Cotterell and Kamminga, 1979, 110; Debénath and Dibble, 1994, 12-13, and others). Peacock (1991, 351) also considered them as significant in distinguishing between populations of artefacts and pseudo-artefacts. However, they were not found at Kończyce Wielkie, except for one occurrence (Table 2).

Bulbar scars (their other name is éraillure) have a similar importance as the former attribute, a number of their features pointing to their similar origin (Cotterell and Kamminga, 1979, 110). Peacock (1991, 352) considered them as significant in his test. Obviously, very small scars can be of natural origin but they are usually very scarce. While analysing all lithic collections it was observed that the scars are more frequent on artefacts from Wallendorf and Wangen than on those from Kończyce Wielkie (Fig. 2, Table 2).

Identification in analysed inventories of a successive feature, of dorsal flake scars parallel with medial axis, which was also accepted by Peacock (1991), can testify to the systematic detachment of blanks from cores. As a rule, in Lower Palaeolithic flake assemblages unidirectional flakes dominate or are comparably frequent with other flakes even in migrating flaking surfaces (e.g. Arzarello et al., 2012; Baales et al., 2000; Carbonell et al., 2009; Mgeladze et al., 2011). In the case of Kończyce Wielkie, no technological trend is visible that would enable the reconstruction of a chain of operations.

The presence of a negative dorsal bulb (contra-bulb) provides evidence of an earlier detachment of flakes from the same sector of a core. In addition, it also provides evidence of whether the flakes were obtained using either percussion or accidental flaking. The lack of contra-bulbs in Kończyce Wielkie points to a high probability of natural factors participating in the production of flakes.

In the chi-square test, the non-distinguishing features of the finds from Kończyce Wielkie and from Wallendorf appeared to be the degree of weathering of flake scars, the characteristics of butts (faceted butts and the presence of cortex on butts) as well as the number of (if two or more) scars on the flakes' dorsal surfaces.

Apart from the aforementioned features, the presence of Hertzian cone cracks on butts and the frequency of negatives on the dorsal surfaces of flakes were also taken into account. Hertzian cone cracks, as generally known, have been usually produced through percussion with a hard hammer (Cotterell and Kamminga, 1987, 686ff.).

In Lower Palaeolithic inventories, we thus can expect the occurrence of the Hertzian cone on the flake butts' deprived cortex. It follows from the list in Table 4 that on the butts from Kończyce Wielkie and on the pseudo-artefacts from Mokrzeszów, cone cracks occur only as single events, whereas at Wallendorf and Wangen they have been recorded frequently (see Fig. 4; Thum and Weber, 1991). It seems that a lack of Hertzian cones points to a non-cultural origin of the finds from the Kończyce Wielkie site.

Table 4
Additional features testing artefacts and geofacts.

Sites	Hertzian cone/ sample		Average of dorsal scars	Maximum number of scars
	N	%	*N*	%
Kończyce Wielkie 4	0(19)	0	1.92	4
Mokrzeszów	1(19)	5.26	2.38	5
Wallendorf	41(50)	82	3.32	7
Wangen	21(35)	60	2.86	9

Table 5
Kończyce Wielkie. Results of radiocarbon and termoluminescence dating.

No lab	Method	Depth (m)	Age	Source
Gd-1446	^{14}C	6.2	>46000 BP	Jersak, 1983
Gd-940		6.2	>41500 BP	
Gd-938		6.5	>35000 BP	
GdTL-5	TL	5.5	75000 ± 15	Archive of Institute of Physics,
GdTL-4		6.2	77000 ± 13	Silesian University of Technology GADAM

A component of another attribute, i.e. the number of dorsal scars clearly distinguishes the sites of Kończyce Wielkie and Mokrzeszów from those of Wallendorf and Wangen. As can be seen in Table 4, the objects from Kończyce Wielkie have the least numerous negatives. In contrast, the maximum number of negatives at Wallendorf or Wangen is larger and it is close to the negative number known from other Lower Palaeolithic assemblages (e.g. Baales et al., 2000).

In concluding the remarks on flake attributes, we present a plot (Fig. 5) showing the scoring of attributes from Table 2 (Peacock, 1991). The finds concentrated on the left-hand side of the plot are geofacts, whereas the artefacts are located on its right-hand side. The objects located between them can represent a mix of both artefacts and geofacts. The plot demonstrates that the finds from Kończyce Wielkie and Mokrzeszów tend to cluster on its left-hand side. The mean score for Kończyce Wielkie equals 1.96, whereas that for Mokrzeszów is 2.0. The artefacts from Wallendorf and Wangen are distinctly concentrated on the right-hand side of the plot. Consequently, the mean score for Wallendorf equals 4.84, and is a little bit lower than the 5.28 for Wangen. All the aforementioned attributes allow for the classification of the flakes from Kończyce Wielkie as geofacts.

Foltyn and co-authors except for flakes recognised also core tools or cores (see Fig. 3: 1, 5; Foltyn et al., 2010a, Figs 10:6 and 11). However, in the opinion of one of the present authors (AW), the finds cannot be considered as a tool manufactured or a natural stone chunk adapted by a human. One can distinguish traces of simple detachments of small flakes on one or two sides showing the initiation of a crack by bending action sensu, Cotterell and Kamminga (1987) or traces of composite detachments, which caused the separation of two flakes on both sides during one wedging event, imitating bifacial processing (Foltyn et al., 2010a, Fig. 11). The pattern and insignificant number of flake negatives resemble clasts of fluvial material that can imitate artefacts (Albrecht and Moser, 1996; Gillespie et al., 2004). It is noteworthy that the negatives of the latter series are quite differently preserved than surfaces with large negatives, which can point to another episode of edge destruction. Edge modifications similar to those on the finds from Kończyce Wielkie frequently occur on natural pebbles in fluvial sediments (e.g. Hemingway et al., 1989) and on flat objects altered by sediment consolidation (Eren et al., 2011).

The mechanical and technological parameters considered above, allow for the discarding of the hypothesis of the accumulation of artefacts at the Kończyce Wielkie site. The results of testing of particular features indicates unambiguously that the group of finds in question shows closer similarity to objects (geofacts) created by natural factors than to archaeological assemblages.

Taking into account the above remarks and technological experience of one of the authors (AW), it should be noted that the finds from Kończyce Wielkie 4 as an assemblage do not represent an archaeological value. Also, none of the items analysed individually cannot be considered an artefact. Of course, on the finds from Kończyce Wielkie features found among artefacts are to be perceived. It should be emphasized, however, that if they appear, they are isolated or in small numbers. They cannot, therefore, constitute a basis for the recognition of these finds as a result of human activity.

The consequence of treatment of natural objects as artefacts became a creation by Foltyn et al. (2010) of an industry, for which it is difficult to find a consistent typological analogies among Eurasian, well-preserved sites from the Early and Early Middle Pleistocene (Moyano et al., 2011). The distinction of macro- and microlithic forms of tool draws attention.

The lack of technological links between 'tools' and 'cores and cores' reduction products' also raises objections. On the European and Middle East sites from this period, very consistent traces of use of technological solutions that make a clear scheme of the operation can be found. A significant feature of the operating sequence is the relation of production strategy with a specific stone raw materials resources and manner of activity (Carbonell et al., 2009; Moyano et al., 2011; Barsky et al., 2013). For example, the small flakes in Bizat Ruhama result from transformation of larger flakes treated as cores (Zeidner, 2013). This strategy could result from lack of access to large blocks of raw materials. In Kończyce Wielkie it is difficult to present a logical explanation of such a structurally diverse assemblage, where large, marginally 'retouched' pebbles and microlithic flakes neighbour.

4.2. The problem of dating the muddy and loess sediments of the upper part of Kończyce Wielkie profile

The chronology of the alleged artefacts from Kończyce Wielkie 4 is based by Wójcik et al. (2004) and Foltyn et al. (2010a, 2010b) on palaeomagnetic, palinological and pedological data. These authors consider the sediments of the upper part of the Kończyce profile, comprising loess and the underlying muddy strata, as formed during the time span between 780 ka (corresponding to the Brunhes-Matuyama magnetic reversal) and 20 ka, when the deposition of the loess succession terminated (see Fig. 6A). The lower parts of the profile are believed by these authors to contain lower Pleistocene sediments, older than 780 ka. In their analysis, however, earlier comprehensive regional, stratigraphic and palinological studies on loess by Jersak (1983), Jersak et al. (1992) and Starkel et al. (2007) are not taken into consideration. Neither do Wójcik et al. (2004) and Foltyn et al. (2010a, 2010b) take into account the results of numerous geological studies undertaken on the equivalent strata nearby, on the territory of the Czech Republic (e.g. Břízová, 1994; Macoun et al., 1965; Macoun, 1985a, 1985b, 1989; Růžička, 2004; Tyráček and Havlíček, 2009; Vodičková, 1981). Moreover, they do not take into consideration the influence of the quaternary rhythm of climatic change on the development of sedimentary succession at Kończyce, as pointed out by Salamon and Wójcik (2010).

In contrast to Wójcik et al. (2004) and Foltyn et al. (2010a, 2010b), we are convinced that the entire Kończyce profile can be successfully and reliably interpreted on the basis of the robust research results reported in the publications referred to above, without the necessity of invoking ice-sheet transgressions that have never been earlier noted in South Poland (Fig. 6B). The palaeomagnetic results showing reverse magnetic polarity of the Kończyce sediments (op. cit.) can, in their turn, be effectively correlated with the Blake Event in the 5e Marine Oxygen Isotope Stage (Smith and Foster, 1969).

Two earlier regional papers in which the Kończyce profile is characterised in respect of its age and origin (Table 5; Jersak, 1983; Jersak et al., 1992), point out that the loess in the northern foreland of the Carpathians, including that of Kończyce accumulated under periglacial climatic conditions during the Weichsel (70–20 ka) glaciation. The age of the loess from Kończyce Wielkie was

estimated with the ^{14}C and TL methods (Jersak, 1983; Jersak et al., 1992) well before the carrying out of the palaeomagnetic tests reported by Wójcik et al. (2004). Three samples dated by the ^{14}C method yielded open results. A sample collected at a depth of 6.5 m of the profile yielded >35 ka BP (Gd 938), whereas two samples from a depth of 6.2 m yielded >46 ka and >41.5 ka (Jersak at al. 1992). Dating by the TL-method resulted in the value of 77 ka for the sample from 6.2 m, and in 75 ka for that collected at a depth of 5.5 m (Table 5). These results correspond well with the present state of regional knowledge, according to which the loess sedimentation began around 70 ka over the entire Western and Central Europe (Antoine et al., 2003, 2009; Jersak, 1991; Meszner et al., 2011; Wagner, 2011). They are also fully concordant with the regional stratigraphical model of the aeolian strata as described by Jary (2009).

A further disputable question is an interpretation by Foltyn et al. (2010a, 2010b), in which they considered the pedogenic horizons in the Kończyce loess as interglacial palaeosols, referring to the studies of Budek et al. (2004) and Drewnik et al. (2004). However, the investigations published by the latter authors, pointed out the lack of interglacial-related features in the studied loess, which, on the contrary, had been found to display characteristics typical of soils formed during colder, interstadial periods (Budek et al., 2004; Drewnik et al., 2004). Thus, their interpretation of the pedogenic horizons is in agreement with the earlier opinions of Jersak (1983; Jersak et al., 1992).

Another problem is posed by the contentious conclusions resulting from the palinological analyses on which Foltyn et al. (2010a) based their age estimation. One of their co-authors, M. Nita, has studied the middle part of the Kończyce profile, located within the so-called Lower Organic Mud as well as its upper part, situated in the Upper Organic Mud Group V (Foltyn et al., 2010a, Fig. 3). The investigations led to the conclusion that the studied sediments dated back to the Ferdynandów interglacial (MIS 13–15; Foltyn et al., 2010a, 2010b; Wójcik et al., 2004). However, the same profiles when studied earlier by Jastrzębska-Mamełka (Jersak, 1983; Jersak et al., 1992), had yielded information about a sparse tundra vegetation, consisting of mainly (80–90%) of herbaceous plants. The presence of a few pollen grains attributable to such stenothermal plants as *Carya, Pterocaria, Carpinus* and *Quercus,* had been interpreted as due to redeposition. The age of the sediments had been estimated as equivalent to the early Weichsel glaciation.

According E. Břízová (pers. comm. 2011) the palinological diagram of Foltyn et al. (2010a) suggests that the distinguished phases B3 (*Alnus - Carpinus - Corylus* I) and B7 (*Carpinus - Corylus – Alnus II*) can represent a fragment of Eem profile E5 (*Carpinus - Corylus - Alnus*). The alternation of phases B3 and B7 seems to reflect cryoturbations, which are visible in the sediment (in Fig. 2c of Budek et al., 2004).

For Wójcik et al. (2004) and Foltyn et al. (2010a, 2010b) of key significance are the results of palaeomagnetic investigations they report on. These results have shown that samples collected from the lower part of the Organic Series reveal reverse magnetic polarity. On this basis, these authors assume that the profile of Kończyce Wielkie has recorded the Brunhes/Matuyama magnetic polarity change. However, in the light of the studies on loess and muddy sediments carried out by Jersak and Jastrzębska-Mamełka (Jersak, 1983; Jersak et al., 1992), and of the dating of those deposits with ^{14}C method (Jersak op. cit.), and TL method at the Gliwice Absolute Dating Methods Centre (Table 5); one can infer that the

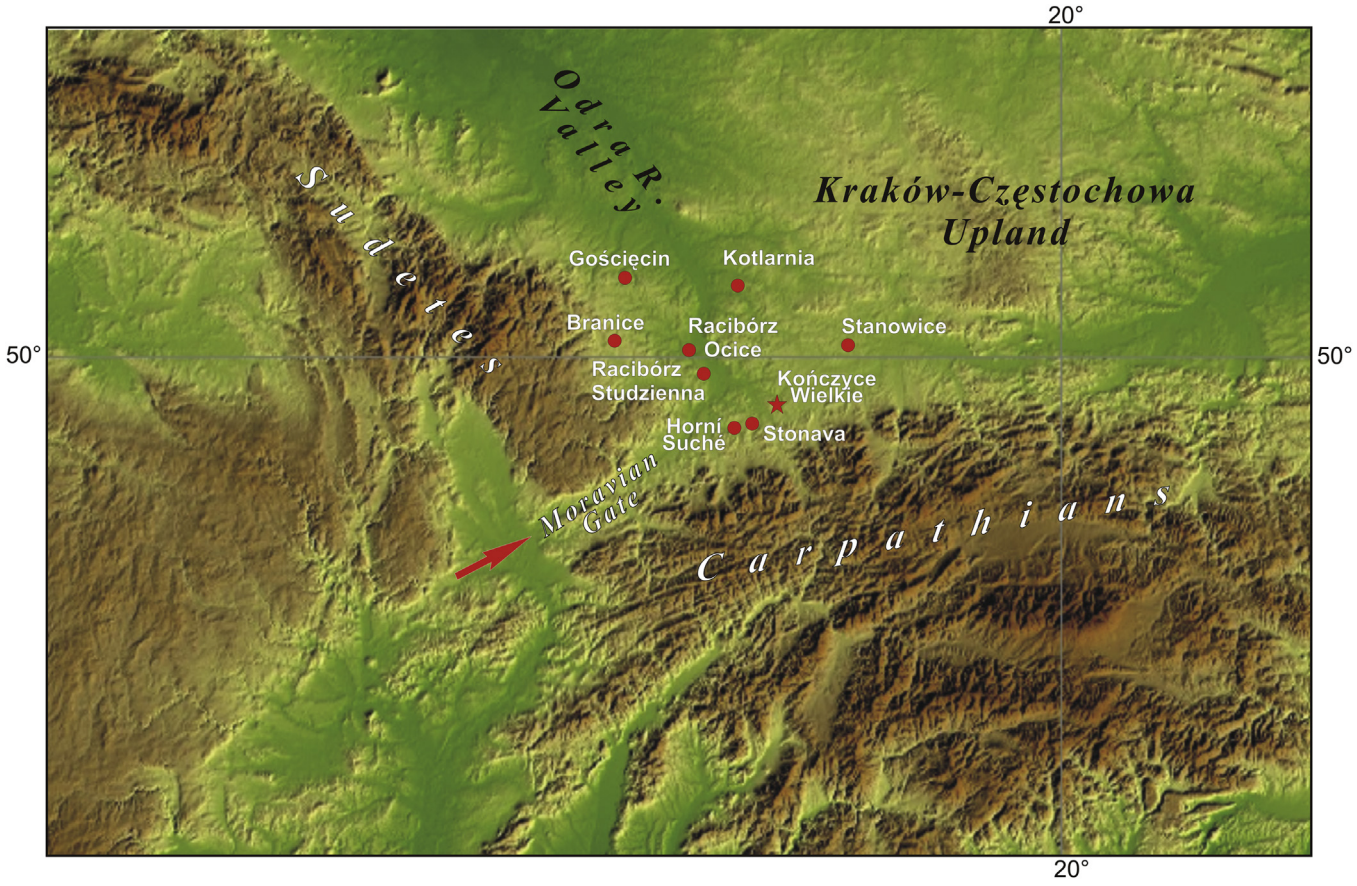

Fig. 7. Location of the key geological sites with Quaternary deposits in the area of Kończyce Wielkie and its proximity (see Fig. 8).

sediments in Kończyce Wielkie are much younger than considered by Foltyn et al. (2010a, 2010b). Therefore, it is reasonable to assume that the sediments in question were deposited mainly during the Weichsel glaciation (Jary, 2009; Jersak, 1983; Jersak et al., 1992; Růžička, 2004; Starkel et al., 2007). The loess is related to the youngest Weichsel glaciation. Possible loess occurrences associated with older glaciations could not have survived because of several ice-sheet advance and recess cycles during the Elster and the Drenthe glaciations. In the neighbourhood of the Moravian Gate, it is only the Warthe glaciation loess patches that may have been preserved sporadically (Fig. 8). Following each glaciation, a lowered erosional base of the River Odra forced an intense denudation of weakly consolidated sediments. It is thus difficult to imagine how a continuous loess succession representing a time span of ca 780 ka may have survived, as is assumed in the papers of Foltyn et al. (2010a, 2010b).

It is in such wide palaeovalleys as the Moravian Gate that local lakes preferentially formed and were filled with organic sediments, muds and clays. Interglacial lacustrine successions of variable age have been known for decades from the area of the Moravian Gate. The closest Holsteinian lacustrine succession of Stonava occurs as close as ca 5 km west of Kończyce Wielkie (Břízová, 1994). The deposition of younger glaciofluvial deposits of the Drenthe glaciation in the Moravian Gate area has been estimated by Nývlt et al. (2011) at 162.0 ± 9.4 ka. In erosional depressions of this glaciofluvial succession, Eem lakes formed as well as those associated with the subsequent cooling of the Weichsel glaciation (Macoun et al., 1965). The youngest loess commonly occurs over the entire area of the Moravian Gate.

In conclusion, we are of the opinion that in the middle part of the Kończyce profile, sediments related to the Elster glaciation (glaciogenic deposits) and probably the Drenthe glaciation (upper fluvial gravel according to the division of Foltyn et al.) occur. These are covered by younger fine-grained deposits, including the loess related mainly to the Weichsel glaciation (Fig. 6B). There is no need, nor serious arguments for introducing the idea of glaciations into the Moravian Gate, whose vestiges have been known so far exclusively from northeast Poland (Lindner et al., 2013). The sedimentary profile

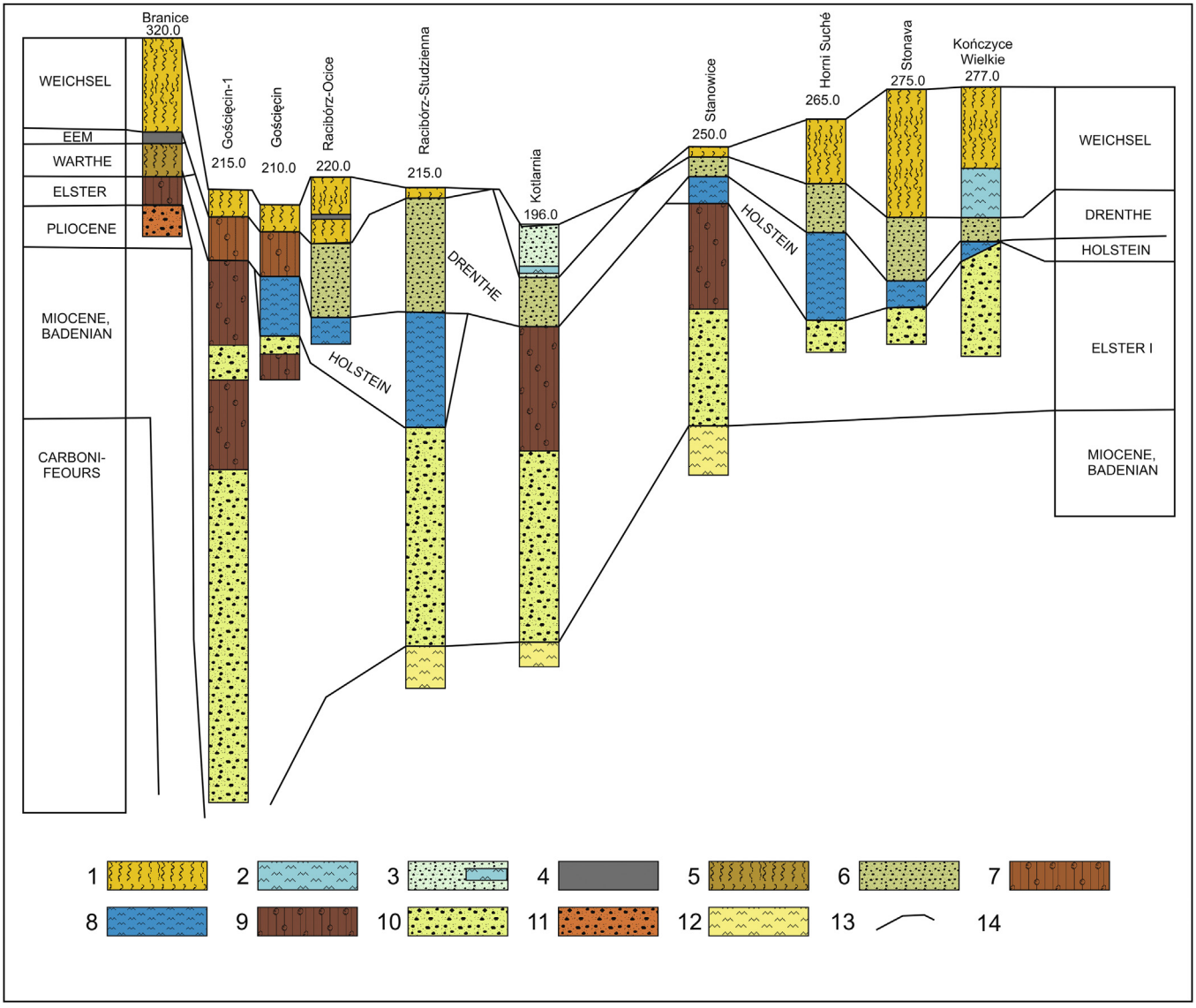

Fig. 8. Schematic correlation of the most important sections of Pleistocene deposits in the region of Kończyce Wielkie. Key: Weichsel: 1 – loess; 2 – silt; 3 – sands, gravels and silts; Eem: 4 – soils; Warthe: 5 – loess; Drenthe: 6 – sands and gravels; 7 – glacial tills; Holstein: 8 – silts; Elster: 9 – glacial tills, 10 – sands and gravels; Pliocene: 11 – sands and gravels; Miocene, Badenian: 12 – clays; 13 – correlation border. At the top of every log – metres above sea level.

of Kończyce Wielkie can be successfully correlated with those from numerous other sites in the Moravian Gate and Oświęcim Basin (see Figs. 7 and 8). The Kończyce profile is not different to them in spite of the opposite opinion of Foltyn et al. (2010a, 2010b).

5. The question of Lower Palaeolithic colonization in Central Europe before MIS 15

The results presented in the article, which question the site in Kończyce Wielkie, of course, does not constitute a decisive proof of human absence to the north of the Carpathians and the Sudeten during the Matuyama-Brunhes boundary and before it.

To date, on the Central Europe colonization's pace two polarized views were presented. The first one is that the area was colonized slightly later than other regions of Europe, i.e. not sooner than about 640 thousand years ago. This hypothesis is based on the assumption that only sites dated to the period from the MIS-15 have provided irrefutable evidence of humans' presence. These sites include Miesenheim, Mauern and Kärlich H (Haidle and Pawlik, 2010, pp. 147–148, where further references). Other sites from this area, which are dated to the period even before the Matuyama/Brunhes or shortly after it, due to unclear origins of stone finds' features or/and complicated stratigraphic situation are questioned (Baales et al., 2000; Haidle and Pawlik, 2010; Roebroeks and van Kolfschoten, 1995).

The second view, in turn, points out a long chronology of occupation of the northern part of Central Europe. This could be indicated by finds from the site Untermassfeld, Thuringia, which based on paleomagnetic and biostratigraphic data can be correlated with MIS31, i.e. it can be dated to about 1 million years ago (Kahlke et al., 2011; Garcia et al., 2013). Unfortunately, this site contains a small number of stone finds as for the excavated area and extremely low ratio of cores' number to flakes' indicates a strong influence in the site forming of fluvial processes (see for example Schick, 1986; pp. 82–83). Several remains indicate that to the Trans-Carpathians area human groups could have arrived before Matuyama-Brunhes up to 48° N (Korolevo, Gostry Verkh layer VII, Gladilin and Sitlivy, 1990; Koulakovska et al., 2010).

In conclusion, it must be pointed out that number of traces located to the north of the mountain ranges of Central Europe, which are dated to the Early Pleistocene or to the early Middle Pleistocene is negligible. Number of sites from the later period, i.e. from the middle and late part of the Middle Pleistocene is much larger. It seems that the reasons for absence or incidental occurrence of sites in this part of Europe may be linked with unfavourable climate and natural conditions that occurred in MIS22-880-870 ka. In this period there was a development of glaciations (Ehlers and Gibbard, 2007), which could have discouraged human migrations to the north beyond the Carpathians and Sudetes (Muttoni et al., 2010). In the northern area winters had to be very harsh, short growing seasons might limit the vegetation and eventually lead to reduction of fauna biomass (MacDonald et al., 2012). If visits there took place, they had to be extremely short and incidental. Visits in these conditions could not be continued on the same scale like in the case of southern Europe, e.g. the Iberian Peninsula (Bermúdez de Castro and Martinón-Torres, 2013; Rolland, 2013). In these conditions it is difficult to imagine functioning of the Moravian Gate track as the main corridor, as suggested by Foltyn et al. (2010, p. 1896). The Moravian Gate began to play the role of the route used intensively by humans not sooner than at the end of the Middle or Upper Pleistocene, as evidenced, amongst others, by traces of stone raw material circulation between the 'south' and the 'north', found on the Middle and Upper Palaeolithic sites in the Czech Republic and Poland (Féblot-Augustins, 1999).

6. Conclusion

Our study of the Kończyce Wielkie site led to the revision of its research value as well as the age and palaeogeographic setting of the locality. The important conclusions are that the study on raw materials of finds collected by Foltyn et al. (2010a, 2010b) shows unambiguously that the finds are a result of geological accumulation due to glaciogenic processes. The state of preservation of the finds, combined with their mechanical and technological features, when compared to those aspects in reliable Lower Palaeolithic artefacts allow for the rejection of the hypothesis assuming their relationship with human activities. The entirety of the collection of Foltyn et al. (2010a) is thus, in our opinion, composed of geofacts.

The stratigraphic interpretation of the Kończyce Wielkie site offered by Foltyn et al. cannot be a reliable basis for dating of their finds. The entire age interpretation is based on disputable palaeomagnetic and ambiguous palynological results. In consequence, the chronological model adopted for the Kończyce Wielkie, does not correlate to the regional stratigraphy.

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